

closed), the natural current or "draught" in the chimney *g* will be increased by the fire, as explained at page 578, and the currents, or "draughts," in the remaining seven will be checked, totally stopped, or even reversed. We will endeavour to make this fact clear by the following reasoning:—

Taking it for granted that the eight chimneys are of equal sectional area, we will, in order to avoid complexity, suppose that the natural current existing in each of them is of equal velocity with the rest; say 10 cubic feet per second for each, or 80 cubic feet per second for the whole eight, taking this quantity to represent the maximum amount of external air capable of gaining admittance through the crevices around the outer doors and windows; which, we may here remark, is the only medium of supply allowed by the present system of constructing dwelling-houses. If then, by the aid of a fire, we increase the velocity of the current in any of the eight chimneys, say at *g*, until we double it: instead of 10 cubic feet per second, we shall have 20 cubic feet of air per second passing upwards through it; and as this increased quantity cannot be supplied from the same limited source as in the first instance, i. e. the crevices around the closed doors and windows, it follows that the increased 10 cubic feet per second is taken from the remaining seven chimneys; and consequently each chimney has one-seventh less than at first, and the currents in them are therefore checked. By increasing the current at *g* to eight times its original velocity, i. e. 80 cubic feet per second, it is clear that it will then absorb the whole of the air previously passing through the whole eight, at the rate of 10 feet per second; and therefore the upward currents of the remaining seven will be stopped. And if by increased firing, we increase still more the velocity of the current at *g*, say to 150 cubic feet per second, we will not only absorb the whole original supply of 80 cubic feet per second, but we must have 70 cubic feet per second in addition; and as the crevices admitting it can only give us the former quantity, the additional 70 cubic feet will find a way in by some other aperture; and as the openings of the remaining seven chimneys are the only other apertures, the additional supply will flow downward through them at the rate of 70 cubic feet per second for the seven, or 10 cubic feet per second for each; and therefore their natural currents or "draughts" will be reversed.

These natural currents are also impeded, or even reversed, in many cases where the chimneys in the same building are not all raised to the same level; and here it may be well to explain that it is the level of the tops of chimneys, and not their relative lengths, that regulates their influence upon each other. For instance, if two chimneys in the same house be constructed of different heights, one reaching only to the level of the second floor, whilst the other extends to the full height of the house; it will invariably be found that when the doors of communication between the two are open, and all other doors, windows, and other apertures are closed, the longer chimney will check, or perhaps even reverse the current or "draught" of the short one. This is a very important point, and it is desirable that it should be clearly understood, and remembered; as we shall have shortly to account for many of the causes of "smoky chimneys," by tracing them to a neglect of its due consideration of this individual question.

We will endeavour to make it plain by the following illustration:—Let fig. 8 represent part of a house of four stories, with a room A, built out from it. Let B represent a room on the top floor, communicating with A by the staircase, passage, and the door at C; and *a* and *b* representing the high and low chimneys respectively. Let it be understood that when the outer doors and windows are closed, no free communication with the external atmosphere can exist except through the chimneys *a* and *b*; also, that the atmospheric pressure at the tops of these chimneys differs, in consequence of the difference of their levels, i. e. the pressure is least at the top of *a* and greatest at the top of *b*. Now, if we cut off the communication between the rooms A and B by closing the door at C (all other doors and windows being closed) we will find there is no current of air either in *a* or *b*,

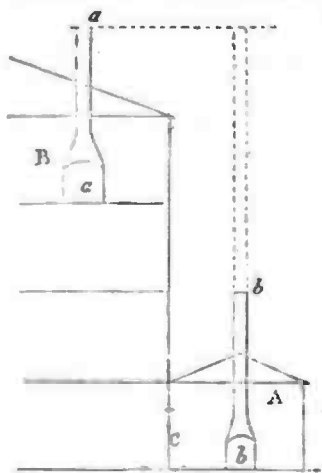


Fig. 8.

and that although the internal air is warmer, and therefore rarefied, or lighter than the external air, it is quite motionless, as already explained in the case of the engine chimney previous to cutting the flue opening. And when we consider that the volume of this rarefied air fills the whole building, pressing equally in every direction, and extending to the level of the top of each chimney, it will not be difficult to perceive that the air in the chimney *a* forms part of a column whose base presses against one side of the door C; whilst that in *b* forms part of another column, whose base presses against the opposite side; and as the atmospheric pressure is greater at the top of the column *b* than it is at *a*, it follows that the door sustains a greater pressure on the side of *b* than it does on that of *a*. If, then, we open the door C, we bring the two columns into contact, and the heavier one *b* preponderating, the rarefied air is forced upwards through *a*, and the current thus commences and will continue to flow down the chimney *b* to supply the higher chimney *a* so long as the communication between the two rooms remains unbroken. This result would not take place if the chimney *b* were raised to the same level as *a*, as shown by dotted lines, for in that case the atmospheric pressure at the top of each would be equal, and the two columns would therefore balance each other.

T.B.A.

#### DOCTORING DAMP ROOM-WALLS.

GRIEVOUS home-discomforts may "a smoky house and a scolding wife" be, to those who have had the misfortune to experience such evils, but even these *paucres misérables*, we dare say, would willingly exchange a damp house for a smoky one, and even a rheumatic wife for a scolding one, if as fully experienced in the one class of grievances as in the other,—more especially since the "rheumatism" is not peculiarly a feminine infirmity, like the lingual lubricity complained of: neither is it the only, or even the worst, of the evils generated by that scourge of our sea-girt isle, the damp. That a little gossip, therefore, about doctoring damp walls, will not be unacceptable to our non-professional readers, we do not doubt. We shall first take a rapid revisionary glance over what has been already said or done, however, on this subject, limiting our remarks more particularly to the obviation of the evil effects of damp on the health, in walls already built; inasmuch as we have already more fully and frequently discussed the subject in its professional than in its popular aspect. This we do without prejudice to the fact that it is infinitely better to go to the root of the evil—where that can, even *ex post facto*, readily be done—than merely to suppress its symptoms,—to prevent its access to walls, *ad initio*, than to doctor walls already steeped in moisture.

Various have been the appliances to the interior surface of walls, in order to prevent the evaporation of damp into dwellings, and to obviate the train of evils induced by the consequent dampness of bed and body clothing, beds, mattresses, sofas, carpets, and, in short, of all that will absorb moisture from the damp atmosphere—itself a constant source of injury, directly no less than indirectly, to the health, as well. Perhaps the oldest of these appliances are cements: the ancient tapestry was

obnoxious to the charge of harbouring the damp, which in many cases rotted it into tatters, in place of being any defence against it. It has been found, however, that pure cements at least, without some admixture of oleaginous or other water-repelling material, were incapable of entirely excluding damp from the interior surface of walls, or even from the walls themselves when laid at their foundations. Instances of their failure will be found recorded at p. 25, Vol. VII., of *THE BUILDER*. A "cement-stone," composed of lime, well slacked, and sand, in equal quantities, tempered with linseed oil to the consistence of mortar, and beat well in a trough, has been found, it is said, to do better than ordinary cement for such a purpose. In applying it to brick walls, the face of the brick should be chipped with a brick hammer, and drenched with a mixture of linseed oil and white lead till it will absorb no more. Dr. Ure gives the following proportions for a somewhat similar composition: twenty parts clean river sand, two litharge, one quick-lime (or additional litharge in place of quick-lime), made into a thin putty with oil. The proportion of sand, however, is surely a mistake: to make a cement of so much sand would seem to be a task even still more difficult than that of the "rope of sand" of olden celebrity. Besides coating brick walls, this "mastic," as it is called, is said to be capable of cementing and mending broken stones, such as steps or lintels.\*

Another composite, or mongrel cement, has been recommended by a practical man, in the following instructions:—"Boil two quarts of tar with two ounces of kitchen grease for a quarter of an hour, in an iron pot: add some of this tar to a mixture of slacked lime and powdered glass, which has passed through a flour-sieve, and been dried completely over the fire in an iron pot, in the proportion of two parts of lime and one of glass, till the mixture become of the consistence of thin plaster. This cement must be used immediately after being mixed. It is not well to mix more at a time than will coat one square foot of wall, as it quickly becomes too hard for use, and continues to increase its hardness for three weeks. Great care must be taken to prevent any moisture from mixing with the cement. For a wall which is merely damp, it will be sufficient to lay on one coating of cement, about one-eighth of an inch thick, but should the wall be more than damp, or wet, it will be necessary to coat it a second time. Plaster, made of lime, hair, and plaster of Paris, may be afterwards laid on the cement."

In one of the Fine-Art Commission reports, an account is given of an appliance, by two French chemists, for the exclusion of damp from the interior surface of walls. To prepare the cupola of the Pantheon, at Paris, for painting on, the face of the stones composing it was heated, bit by bit, and a composition applied, consisting of one part wax and three parts oil, boiled with one-tenth of its weight of litharge. The absorption, it was said, took place readily by means of heat, and the liquid penetrated the stone from a quarter to half an inch. The composition acquired solidity as it cooled, and became hard in six weeks or two months. For ordinary purposes, as we have before remarked, resin might be substituted for wax: indeed, the composition thus modified has been employed with effect, by help of heat, in the protection of the interior of room-walls from damp, even where the damp arose from an impregnation of deliquescent salt, which had previously penetrated through a coating of stucco, laid on in the vain hope of smothering the deliquescence,† which rendered the place uninhabitable, even in summer. This "mastic" consisted of one part linseed oil, boiled with one-tenth part litharge, and two parts resin. It was necessary to dry and heat the walls by means of a portable furnace, and of course also to heat the composition.

Effectual as some of these cements and mastics may be, the application of most of

\* Under the euphonious name of Oropholite, a composition of this kind was some time since invented, and applied as a mastic plaster on coarse canvases, forming a sort of cloak for roofs and other coverings, but not, ostensibly at least, for walls.

† For the permanent removal of such deliquescence, it has been recommended to wash the wall with a strong solution of alum. By means of alum, too, stone, such as damp hearth-stone, or kitchen pavement, we presume, inclusive, may, it is said, be rendered impervious to damp, after soaking with soft-soap solution.